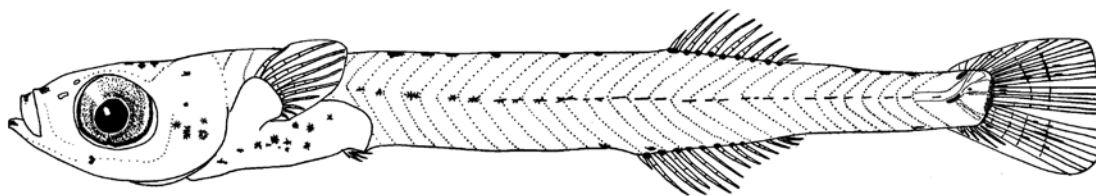




PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF
ATHERINID FISHES OF THE WESTERN CENTRAL NORTH ATLANTIC

BY

LOURDES VÁSQUEZ-YEOMANS & MARTHA VALDÉZ-MORENO



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149

May 2002



PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF
ATHERINID FISHES OF THE WESTERN CENTRAL NORTH ATLANTIC

BY

LOURDES VÁSQUEZ-YEOMANS & MARTHA VALDÉZ-MORENO

U.S. DEPARTMENT OF COMMERCE
Donald L. Evans, Secretary

National Oceanic and Atmospheric Administration
Conrad C. Lautenbacher, Jr., Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service
William T. Hogarth, Assistant Administrator for Fisheries

May 2002

This Technical Memorandum series is used for documentation and timely communication of preliminary results, interim reports, or similar special-purpose information. Although the memoranda are not subject to complete formal review, editorial control, or detailed editing, they are expected to reflect sound professional work.

NOTICE

The National Marine Fisheries Service (NMFS) does not approve, recommend or endorse any proprietary product or material mentioned in this publication. No reference shall be made to NMFS or to this publication furnished by NMFS, in any advertising or sales promotion which would imply that NMFS approves, recommends, or endorses any proprietary product or proprietary material mentioned herein or which has as its purpose any intent to cause directly or indirectly the advertised product to be used or purchased because of this NMFS publication.

This report should be cited as follows:

L. Vásquez-Yeomans & M. Valdéz-Moreno. 2002. Preliminary guide to the identification of the early life history stages of atherinid fishes of the western central North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-481, 7 p.

W. J. Richards, Editor. NOAA Fisheries, 75 Virginia Beach Drive, Miami, FL

This report will be posted on the Bethune Cookman College NOAA Cooperative web site later in 2002 at URL: <http://www4.cookman.edu/NOAA/> and will also appear on the SEFSC web site at URL: <http://www.sefsc.noaa.gov/>. It will be a chapter entitled Atherinidae in the "Guide to the early life history stages of fishes of the western central North Atlantic".

Author's addresses:

L. Vásquez-Yeomans & M. Valdéz-Moreno
El Colegio de la Frontera Sur-Chetumal
Km 2 Carr. Chetumal-Bacalar
Z. Industrial # 2, Chetumal 77000
Quintana Roo, Mexico
E-mail: <lvasquez@ecosur-qroo.mx>
<mvaldez@ecosur-qroo.mx>

Copies may be obtained by writing:

The authors or

National Technical Information Center
5825 Port Royal Road
Springfield, VA 22161
(800) 553-6847 or (703) 605-6000
<<http://www.ntis.gov/numbers.htm>>

The fishes of the family Atherinidae, commonly known as Old World or True silversides, were recently separated from the atherinopsids by Saeed et al. (1994). Dyer & Chernoff (1986b) confirmed this decision based on twenty diagnostic characters. In the western central Atlantic (WCA) area, there are only 3 species of this family (*Alepidomus evermanni*, *Hypoatherina harringtonensis* and *Atherinomorus stipes*) all pertaining to the subfamily Atherinomorinae (Chernoff, 2001).

Atherinids are small fishes <100 mm SL, slender, elongate, and moderately compressed posteriorly, with large eyes. They have an incomplete lateral line, broad silvery lateral band, and the pelvic fins are usually abdominal. The characters that separate this family from the atherinopsids are: premaxilla not protactile; distal end of the premaxilla not expanded; premaxilla with a postmaxillary process; anterior infraorbital sensory canal connected to preopercular canal, and two well-separated dorsal fins, the first with II to V spines (Chernoff, 2001).

Atherinids are small schooling fishes, associated with surface waters during all stages of life, and are extremely abundant in inshore regions, such as lagoons and estuaries. Most atherinids are marine, a few species are found around coral reefs, and other species are confined to freshwater. For example, 19 of the 24 species of the

Craterocephalus are restricted to freshwater in Australia and New Guinea (Nelson, 1994).

The atherinids produce demersal eggs that are usually covered with adhesive filaments which attach to vegetation and debris. Newly hatched atherinid larvae (ca. 3 mm) are slender, with an extremely short gut, and pigmented eyes. A line of melanophores is present along the dorsal and lateral midline from head to the caudal region and dorsally on the gut. The only information on atherinid larvae is for one species of the Indo-Pacific coral reef, *Hypoatherina tropicalis* (Schmitt, 1983). This species has larval characters very similar to atherinopsid larvae.

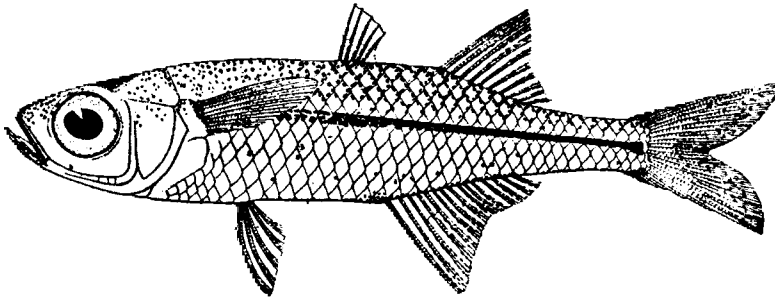
In this guide, we include information on the atherinid larvae of *Atherinomorus stipes*. We identified and illustrated a larval series of *A. stipes* based on meristic and pigmentation characters. It is the most commonly caught atherinid in embayments and lagoons located in waters of Mexican Caribbean waters. A separate paper in preparation will provide a complete description of the early life history stages of this species (Vásquez-Yeomans & Valdéz-Moreno, in prep.). Tables Atherinidae 1 & 2 provide meristic and distribution data. This will aid in identifying the undescribed ELH stages of the two other species. However, care must be taken not to confuse these with the atherinopsids that are very similar.

Table Atherinidae 1. Meristic characters for the atherinid species found in the western central North Atlantic. Counts were obtained from authors listed in Literature Cited.

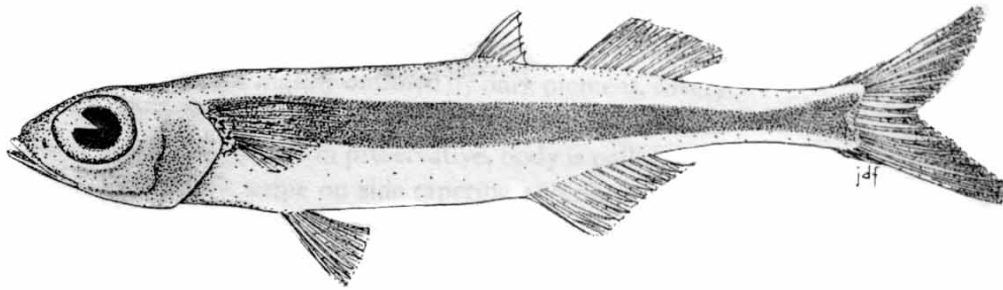
Species	Fin Rays				Gill Rakers	Vertebrae
	First Dorsal	Second Dorsal	Anal	Pectoral		
<i>Alepidomus evermanni</i>	V	I,9-11	I,12-15			
<i>Atherinomorus stipes</i>	IV-VI	I,8-10	I,11-13	14-16		37-40
<i>Hypoatherina harringtonensis</i>	V-VII	I,9-11	I,11-12	14-15	5-6+20-22	43-45

Table Atherinidae 2. Distribution & habitat of atherinids. Data from authors listed in Literature Cited.

Species	Geographical Distribution & Habitat
<i>Alepidomus evermanni</i>	Pinar del Rio & San Cristobal, Cuba primarily in freshwater, occasionally in estuaries or on coast near river mouths & flooded mangroves.
<i>Atherinomorus stipes</i>	From southern Florida to Brazil, including eastern & southern Gulf of Mexico, Yucatan, Bahamas, and Caribbean Sea in coastal habitats over turtle grass beds and upper portions of coral reefs.
<i>Hypoatherina harringtonensis</i>	From southern Florida, Bahamas, Bermuda, & the West Indies including the southern Gulf of Mexico & Yucatan in coastal and offshore habitats, entering turtle grass beds in evening.



Alepidomus evermanni (Eigenmann 1903). Original illustration (probably 45 mm adult).



Hypoatherina harringtonensis (Goode 1877). Illustration from Lavenberg & Chernoff (1995). Drawing done in Fishbase by Robbie Cada (size unknown).

MERISTICS

Vertebrae:	
Total	37-40
Number of Fin Spines and Rays:	
First Dorsal	IV-VI
Second Dorsal I,8-10	
Total 13-17	
Anal	I,11-13
Pectoral	14-16
Pelvic	
Caudal	
Principal	9+8
Gill Rakers 5-6+19-21	

LIFE HISTORY

Range: From southern Florida to Brazil, including eastern & southern Gulf of Mexico, Yucatan, Bahamas, & Caribbean.
Habitat: Shallow waters, freshwater, brackish, marine (reef associated).
ELH Pattern: oviparous, demersal eggs, planktonic larvae.
Spawning:
 Season: Possibly year-around.

LITERATURE

Aguilera 1998; Avilés Torres A. 2002, Castro-Aguirre et al. 1999, Cervignon 1991, Cervignon et al. 1992, Chernoff 2001, Claro 1994, Eschmeyer 1996, Froese & Pauly 2001, McEACHRAN & FECHHELM 1998, Robins & Ray 1986, Schomburgk 1848, Smith 1997, Schmitter et al. 2000.

ILLUSTRATIONS

Original: Early preflexion larva, 3.8 mm, lateral and dorsal views; early flexion larva, 5.7 mm, lateral, dorsal and ventral views; postflexion larva, 11.7 mm, lateral view; late postflexion larva, 15.4 mm, lateral view, developing scales not shown. Larvae collected at Rio Huache, Quintana Roo, Mexico.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Length at hatching: <3.8 mm
Length at flexion: 5.5-6.7 through 8.3-9.0 mm
Length at Transformation: 15-20 mm
Sequence of fin development: C1, D2 & A, P1, C2, P2, D1:

Pigmentation: Head: Initially 3 large melanophores over head (2 over midbrain & 1 over hindbrain) during preflexion stage; melanophores increase over head, 3 small on opercle, usually 1 small melanophore on posterior margin of dentary during flexion; 2 over forebrain, 2 each at nostril, 2 on premaxillary, & 2 on anterior margin of dentary by 10.1 mm; increase in number over forebrain and midbrain, on snout and at dentary by 15.4 mm. Trunk: Dorsum with little pigment, 2-3 melanophores on dorsal margin of last myomere & over tip of notochord in larvae <4.5 mm; increase to 9-22 melanophores on dorsal midline, under notochord & on hypural margin during flexion stage; 2-3 melanophores along dorsal finbase in late flexion stage increasing to 8-9 through postflexion stage; small melanophores anteriorly over dorsum at 12.6 mm, extending to posterior part of the tail >14.5 mm. Lateral midline unpigmented in larvae <4.3 mm; 10-19 melanophores during late preflexion stage; internal series above & below vertebral column on last vertebrae by 11.7 mm; series of melanophores above lateral midline posterior of tail by 12 mm increasing to anterior part of body through postflexion. Ventral pigment absent in larvae <4.0 mm; 4-13 melanophores along ventral margin on tail during late preflexion stage; extending as double row from pelvic-fin bases to anal-fin base by 12 mm; increase number on anal-fin base in postflexion stage. Melanophores dorsally on gut & 3-5 in mid-gut through preflexion & flexion stages, increasing ventrally in postflexion stage.

Diagnostic Characters: Myomeres 36-40 (usually 37-38; 3 melanophores on head (2 on midbrain, 1 hindbrain); 3 small melanophores on opercle in late flexion stage; 1 small pigment spot on posterior part of dentary; 1-4 small melanophores over tip of notochord in larvae <4.0 mm, & below notochord in larvae ~4.5-15.0 mm; dorsally on gut & 3-5 melanophores at mid-gut; scales appear at ~14 mm.

MERISTICS

Vertebrae:	
Total	37-40
Number of Fin Spines and Rays:	
First Dorsal	IV-VI
Second Dorsal I,8-10	
Total 13-17	
Anal	I,11-13
Pectoral	14-16
Pelvic	
Caudal	
Principal	9+8
Gill Rakers 5-6+19-21	

LIFE HISTORY

Range: From southern Florida to Brazil, including eastern & southern Gulf of Mexico, Yucatan, Bahamas, & Caribbean.
Habitat: Shallow waters, freshwater, brackish, marine (reef associated).
ELH Pattern: oviparous, demersal eggs, planktonic larvae.
Spawning:
 Season: Possibly year-around.

LITERATURE

Aguilera 1998; Avilés Torres A. 2002, Castro-Aguirre et al. 1999, Cervignon 1991, Cervignon et al. 1992, Chernoff 2001, Claro 1994, Eschmeyer 1996, Froese & Pauly 2001, McEACHRAN & FECHHELM 1998, Robins & Ray 1986, Schomburgk 1848, Smith 1997, Schmitter et al. 2000.

ILLUSTRATIONS

Original: Early preflexion larva, 3.8 mm, lateral and dorsal views; early flexion larva, 5.7 mm, lateral, dorsal and ventral views; postflexion larva, 11.7 mm, lateral view; late postflexion larva, 15.4 mm, lateral view, developing scales not shown. Larvae collected at Rio Huache, Quintana Roo, Mexico.

EARLY LIFE HISTORY DESCRIPTION

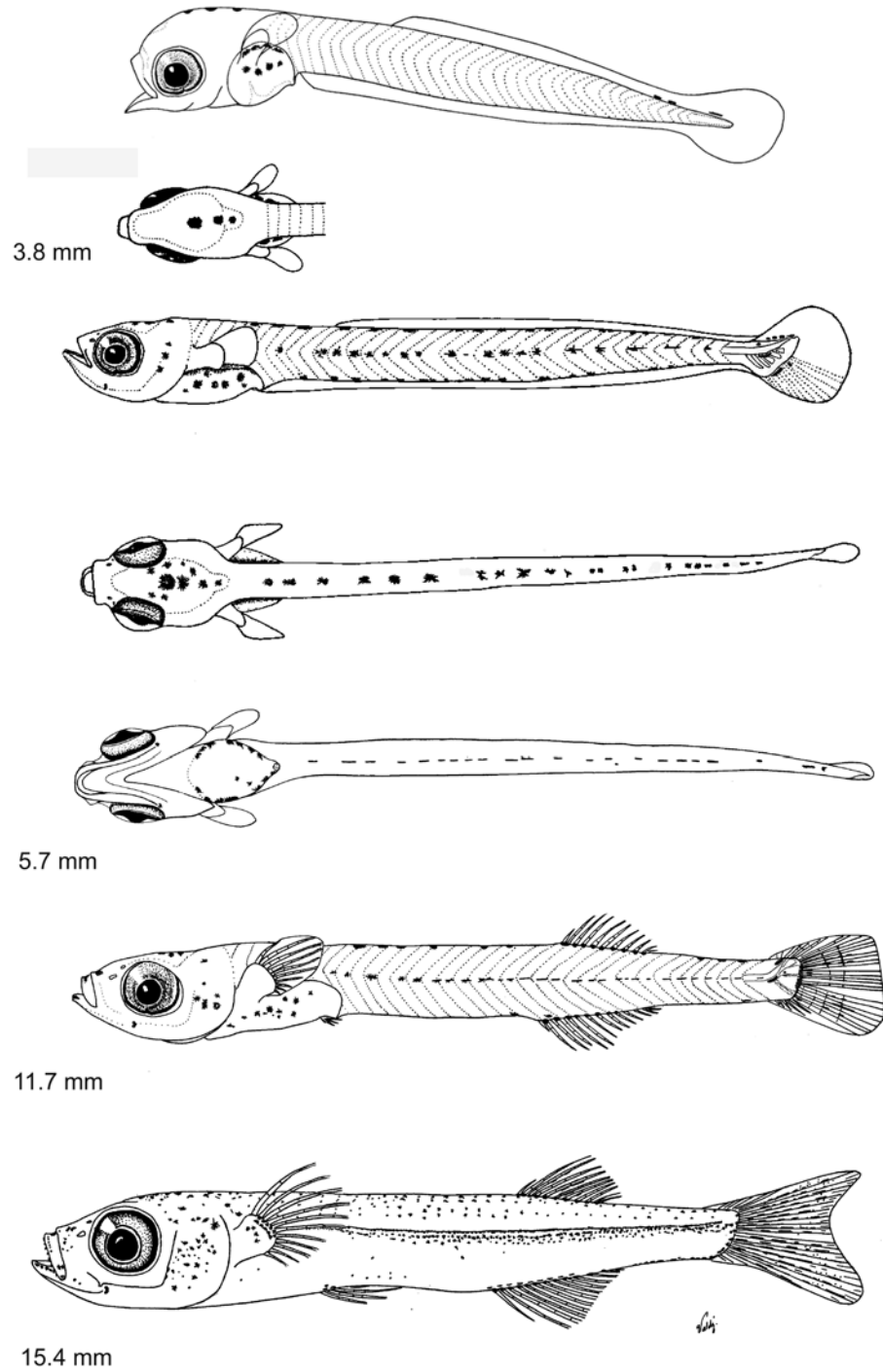
EGGS: Unknown

LARVAE:

Length at hatching: <3.8 mm
Length at flexion: 5.5-6.7 through 8.3-9.0 mm
Length at Transformation: 15-20 mm
Sequence of fin development: C1, D2 & A, P1, C2, P2, D1:

Pigmentation: Head: Initially 3 large melanophores over head (2 over midbrain & 1 over hindbrain) during preflexion stage; melanophores increase over head, 3 small on opercle, usually 1 small melanophore on posterior margin of dentary during flexion; 2 over forebrain, 2 each at nostril, 2 on premaxillary, & 2 on anterior margin of dentary by 10.1 mm; increase in number over forebrain and midbrain, on snout and at dentary by 15.4 mm. Trunk: Dorsum with little pigment, 2-3 melanophores on dorsal margin of last myomere & over tip of notochord in larvae <4.5 mm; increase to 9-22 melanophores on dorsal midline, under notochord & on hypural margin during flexion stage; 2-3 melanophores along dorsal finbase in late flexion stage increasing to 8-9 through postflexion stage; small melanophores anteriorly over dorsum at 12.6 mm, extending to posterior part of the tail >14.5 mm. Lateral midline unpigmented in larvae <4.3 mm; 10-19 melanophores during late preflexion stage; internal series above & below vertebral column on last vertebrae by 11.7 mm; series of melanophores above lateral midline posterior of tail by 12 mm increasing to anterior part of body through postflexion. Ventral pigment absent in larvae <4.0 mm; 4-13 melanophores along ventral margin on tail during late preflexion stage; extending as double row from pelvic-fin bases to anal-fin base by 12 mm; increase number on anal-fin base in postflexion stage. Melanophores dorsally on gut & 3-5 in mid-gut through preflexion & flexion stages, increasing ventrally in postflexion stage.

Diagnostic Characters: Myomeres 36-40 (usually 37-38; 3 melanophores on head (2 on midbrain, 1 hindbrain); 3 small melanophores on opercle in late flexion stage; 1 small pigment spot on posterior part of dentary; 1-4 small melanophores over tip of notochord in larvae <4.0 mm, & below notochord in larvae ~4.5-15.0 mm; dorsally on gut & 3-5 melanophores at mid-gut; scales appear at ~14 mm.



Literature Cited

- Aguilera, O. 1998. Los peces marinos del occidente de Venezuela [The marine fishes of western Venezuela]. *Acta Biol. Venez.* v. 18 (no. 3): 43-57.
- Avilés Torres Silvia. 2002. Influencia de la heterogeneidad espacial y la fluctuación climática en la comunidad de peces del sistema lagunar Río Huach, Sur de Quintana Roo, México. Tesis de Maestría. Centro de Investigación Científica y de Educación Superior de Ensenada. 110 pp.
- Cervigón, F. 1991. Los peces marinos de Venezuela. Fundación Científica Los Roques. v. 1: 1-425.
- Cervigón, F., R. Cipriani, W. Fischer, L. Garibaldi, M. Hendrickx, A. J. Lemus, R. Márquez, J. M. Poutiers, G. Robaina & B. Rodríguez. 1992. Fichas FAO de identificación de especies para los fines de la pesca. Guía de campo de las especies comerciales marinas y de aguas salobres de la costa septentrional de Sur América. FAO. Rome. 513 p.
- Chernoff, B. 2001. Atherinidae. FAO Guide to the Central Western Atlantic. In press.
- Claro, R. 1994. Ecología de los peces marinos de Cuba. Instituto de Oceanología Academia de Ciencias de Cuba and Centro de Investigaciones de Quintana Roo. 545 p.
- Dyer, B., & B. Chernoff. 1996. Phylogenetic relationships among atheriniform fishes (Teleostei: Atherinomorpha). *Zool. J. Linn. Soc.* 117: 1-69.
- Eigenmann, C. H. 1903. The fresh-water fishes of western Cuba. *Bull. U. S. Fish Comm.* v. 22 [1902]: 211-236, Pls. 19-21.
- Eschmeyer, W.N. 1998. Catalog of fishes. Special Publication, California Academy of Sciences, San Francisco. 3 vols. 2905 p.
- Froese, R. & D. Pauly. Eds. 2001. FishBase. World Wide Web electronic publication. www.fishbase.org, 02 October 2001.
- Ibarra, M., & D. J. Stewart. 1987. Catalogue of type specimens of Recent fishes in Field Museum of Natural History. *Fieldiana Zool. (N. S.)* No. 35:1-112.
- Lavenberg, R. J., & M. Chernoff. 1995. Atherinidae. Pejerreyes. P. 889-901. In: W. Fischer, F. Krupp, W. Schneider, C. Sommer, K.E. Carpenter and V. Niem (eds.). Guía FAO para la identificación de especies para fines de la pesca. Pacífico Centro-Occidental 3. Vol. FAO Rome.
- McEachran, J. D., & J. D. Fechhelm. 1998. Fishes of the Gulf of Mexico. Volume 1: Myxiniiformes to Gasterosteiformes. Univ. of Texas Press, Austin. 1-1112.
- Nelson, J. C. 1994. Fishes of the world. Third ed. Wiley, New York. 600 p.
- Robins, C. R., & G. C. Ray. 1986. A field guide to Atlantic coast fishes of North America. Houghton Mifflin, Boston, Massachusetts. 354 p.
- Saeed, B., W. Ivantsoff & L. E. L. M. Crowley. 1994. Systematic relationships of atheriniform families within Division I of the Series Atherinomorpha (Acanthopterygii) with relevant historical perspectives. *Vop. Ikhtiol.* 34(5): 579-610. [*J. Ichthyol.* 34(9): 1-32].
- Schmitt, P. D. 1983. Atherinidae. Silversides, hardyheads. Pages 36-39 in J. M. Leis and D. S. Rennis, eds. The larvae of Indo-Pacific coral reef fishes. New South Wales University Press, Sydney and University of Hawaii Press, Honolulu. 269 p.
- Schmitter-Soto, J. J., L. Vázquez-Yeomans, A. Aguilar-Perera, C. Curiel-Mondragón, y J. A. Caballero-Vázquez. 2000. Lista de peces marinos del Caribe mexicano. *Ann. Inst. Biol. Univ. Auton. Méx. Ser. Zool.* 71(2): 143-177.
- Schomburgk, R. H. 1848. The history of Barbados; comprising a geographical description of the island and an account of its geology and natural productions. London. Hist. Barbados i-xx + 1-722 Remarks: Fishes are on pp. 664-678. Reprinted as Schomburgk, R. H 1848. *Ann. Mag. Nat. Hist., ser. 2, v. 2 (no. 7):* 11-20.

Smith, C. L., 1997. National Audubon Society field guide to tropical marine fishes of the Caribbean, the Gulf of Mexico, Florida, the Bahamas, and Bermuda. Alfred A. Knopf, Inc., New York. 720 p.

Smith-Vaniz, W. F., B. B. Collette, & B. E. Luckhurst. Fishes of Bermuda. Amer. Soc. Ichthyol. Herpetol. Spec. Publ. (4): 424 p.

Vásquez-Yeomans, L. & M. Valdéz-Moreno. In preparation. Larval development of *Atherninomorus stipes* (Teleostei: Atherinidae), from mexican Caribbean waters.